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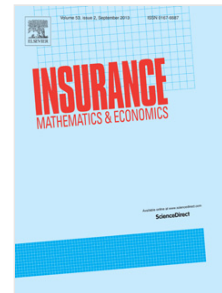
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# The Finite-time Ruin Probability with Heavy-tailed and Dependent Insurance and Financial Risks

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## Abstract

Consider a discrete-time insurance risk model in which the insurer makes both risk-free and risky investments. Assume that the one-period insurance and financial risks form a sequence of independent and identically distributed copies of a random pair  $(X, Y)$  with dependent components. When the product  $XY$  is heavy tailed, under a mild restriction on the dependence structure of  $(X, Y)$ , we establish for the finite-time ruin probability an asymptotic formula, which coincides with the long-standing one in the literature. Various important special cases are presented, showing that our work generalizes and unifies some of recent ones.

*Keywords:* Asymptotics; Dependence; Finite-time ruin probability; Heavy-tailed distribution; Insurance and financial risks; Product

*MSC 2010:* Primary 91B30; Secondary: 62P05, 62E20, 62H20

## 1 Introduction

Consider a discrete-time insurance risk model. Within period  $i$ ,  $i \in \mathbb{N}$ , the net insurance loss (equal to the total claim amount plus other costs minus the total premium income) is denoted by a real-valued random variable  $X_i$ . Suppose that the insurer makes both risk-free and risky investments, which lead to an overall stochastic discount factor over period  $i$ , denoted by a positive random variable  $Y_i$ . In the terminology of Norberg (1999) and Tang and Tsitsiashvili (2003), we call  $\{X_i, i \in \mathbb{N}\}$  insurance risks and call  $\{Y_i, i \in \mathbb{N}\}$  financial risks. Thus, the sum

$$\sum_{i=1}^n X_i \prod_{j=1}^i Y_j, \quad n \in \mathbb{N},$$

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